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Liriodendron Celakovskii Velen.

By Edward W. Berry

In 1881 Professor Velenovsky found a leaf in the Cretaceous Clays, near Kuchelbad, in Bohemia, which he subsequently described * under the above name. Following is his description: "Das Blatt im Umrisse rundlich, seicht dreilappig, der Mittellappen nicht viel länger als die seitlichen, vorne seicht ausgerandet, die seitlichen ebenfalls ausgerandet oder beinahe abgerundet. Der Primarnerv gerade, nicht zu stark, zur Spitze merklich verdunnt; in der oberen Hälfte desselben entspringen noch 2–3 Paare von starkeren Secundarnerven. Beiderseits des Mittelnerven entspringen am Grunde noch 2 Basalnerven, von denen der obere etwa in der Mitte seiner Länge noch ein langes Secundarastchen abzweigt, die feinere nervation ist unkenntlich. Der Blattstiel etwa 2 cm. lang, gerade, am Grunde stark."

This leaf is of considerable interest as it is the only specimen of Cretaceous age in Europe which has been referred to *Liriodendron*, the balance of the European species appearing in the later Tertiary (Oligocene, Miocene, and later) and greatly resembling the existing tulip-tree. A critical comparison convinces the writer that this leaf is in no wise related to *Liriodendron*, and the result seems worthy of publication inasmuch as it limits the known introduction of this genus into Europe to the Oligocene, and suggests that this introduction may have been from the northwest through Heer's *Liriodendron Procaccinii* of the Eocene (or at the very latest Oligocene) of Greenland and Iceland. This species in turn is the logical descendant from forms similar to those found in the Amboy Clays and related strata from New Jersey to Martha's Vineyard.

Velenovsky is positive enough that his identification of this leaf is correct and he compares it to those forms of *Liriodendron Meekii* from Nebraska. While the two leaves are much the same size, *Liriodendron Meekii* is oblong in its general outline while this leaf is orbicular. *Liriodendron Meekii* is almost perfectly fiddle-shaped; the apical lobes are not convergent; the lateral sinuses are in the basal half of the leaf, and are quite decided; the lateral lobes are basal and directed nearly laterally; the secondaries are numerous, and the venation so far as known is that of *Liriodendron*. *Liriodendron Celakovskii* is, on the other hand, a typically trilobed leaf with palmate venation, although the sinuses are shallow and the lobes not particularly well marked; the sinuses are in the apical half of the leaf and are directed downward, while the venation is quite different from that of the former species, with few, and much curved secondaries.

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* Die Fl. der Boehm. Kreideform., Beiträge zur Palaeont. des Oesterreich-Ungarus und des Orient. E. v. Mojsisovics und M. Meumayr, 3 : 18 (43), *pl. 6* (14), *f. 2.* 1884.

The genus *Cissites* which was originally proposed by Heer to include leaves presumably allied to *Cissus*, has been made to include a variety of forms with more or less resemblance to *Vitis*, *Platanus*, *Sassafras*, *Liriodendron*, etc., by later authors. It is with some of these that Velenovsky's leaf shows a decided similarity.

Lesquereux, in discussing his *Cissites obtusilobus*,* notes its resemblance to *Liriodendron Celakovskii*, the venation being however strikingly different.

A *Cissites* which resembles this leaf is *Cissites salisburiaefolius*, Lx. which† species has been referred successively to *Populites* and to *Sassafras*; in fact it resembles some of the obtuse varieties of *Sassafras cretaceum* "so called" very much. It is a somewhat larger leaf than *Liriodendron Celakovskii* and more decidedly trilobed; in some of Lesquereux's specimens which lack the decurrent base the venation is very similar to that of *Liriodendron Celakovskii*.

Another species of *Cissites* which resembles this leaf is Lesquereux's *Cissites Harkerianus*. The two leaves are exactly the same size; the outline is the same, except for the slightly notched apex of *Celakovskii* and the somewhat decurrent base of *Harkerianus*. The venation is similar in the straight primaries and few greatly arched secondaries. ‡

Another species of analogous appearance is *Hedera platanoidea* Lx. His figure of this species (*pl. 3, f. 5*) resembles *Liriodendron*

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* Fl. Dakota Group, 161.

† Am. Jour. Sci. **46**: 94. 1868.

‡ See especially Cret. & Tert. Fl. *f. 3*.

Celakovskii considerably in both size and outline, except for the unnotched apex; the secondaries are more nearly straight, however, and there are no additional veins below the lateral primaries.

Comparing *Liriodendron Celakovskii* with the existing *Liriodendron Tulipifera* we note that, while the outline is not dissimilar from numerous *L. Tulipifera* leaves in my possession, the wide petiole enlarged at the base is widely different. The venation is decidedly different from any form of *Liriodendron*, living or extinct, which I have seen. It is most decidedly palmate, three veins which may be called primaries and two lateral secondaries branching from the summit of the petiole at the extreme base of the leaf blade. The primaries are straight and the lateral ones run directly to the tips of the obtuse lateral lobes. In *L. Tulipifera* what answers to these primaries are seldom straight, do not form such an acute angle with the midrib, and in 99 per cent. of the leaves examined do not run directly to the tips of the lobes, but branch and become more or less obliterated.

The disposition of the tertiary system in the region of the sinus is different; in *L. Tulipifera* a secondary generally runs toward the sinus, forking and striding it.

In *L. Tulipifera* the secondaries are more numerous and branch from the midrib at approximately regular intervals, nor do they ascend in sweeping curves as in *L. Celakovskii.*

The base in *L. Tulipifera* is not straight, but usually decurrent in the smaller leaves, and more or less obcordate in the larger. It would not be difficult to find additional analogues of the leaf in question, and while the writer's knowledge is far to limited to assign *Liriodendron Celakovskii* to its proper place, it would seem to be more nearly related to that somewhat heterogeneous assemblage included in *Cissites.* At least this seems to accord more nearly with its natural affinity than its reference to *Liriodendron*, and we may repeat in conclusion that it is not related to *Liriodendron*, which is the point of emphasis in the foregoing note.

PASSAIC, N. J.